ELSEVIER

Journal of Analytical and Applied Pyrolysis
62 (2002) 281–296

JOURNAL of ANALYTICAL and APPLIED PYROLYSIS

www.elsevier.com/locate/jaap

Effect of reaction conditions on pyrolysis of chlorogenic acid

Ramesh K. Sharma, Travis S. Fisher, Mohammad R. Hajaligol *

Philip Morris USA, Research Center, P.O. Box 26583, Richmond, VA 23261, USA

Received 1 November 2000; accepted 29 January 2001

Abstract

Pyrolysis of chlorogenic acid was studied under various temperature and heating rate conditions. The objective was to investigate the effect of pyrolysis conditions on kinetics and product distribution. Runs were made at atmospheric pressure under inert (non-oxidative) conditions both in a tubular reactor operated under (approximately) isothermal conditions and in a thermogravimetric analyzer (TGA) non-isothermally. The pyrolysis temperature ranged from 120 to 750 °C in the tubular reactor and from room temperature to 800 °C in the TGA. The gaseous products were analyzed by mass spectrometry. The weight-loss due to the volatile products in the tubular reactor increased with temperature from 2% at 120 °C to 80% at 750 °C. The gaseous product was complex in composition consisting of components that corresponded to $m/z = 78$ (benzene), 94 (phenol), 110 (catechol), 122 (benzoic acid), and 136 (vinyl catechol), in addition to $m/z = 18$ (water), 28 (carbon monoxide), and 44 (carbon dioxide). Quinide was also observed in the condensed volatile products. The highest concentration was that of phenol followed by catechol. The data from the TGA also indicated the presence of hydrogen, methane, benzene, toluene, naphthalene, and anthracenel/ phenanthrene at high temperatures. Kinetic analysis yielded a lower apparent activation energy of 79 kJ mol^{-1} for the tubular reactor data compared to 143 kJ mol^{-1} for the TGA data. This suggests that the activation energy for the pyrolysis reactions might be dependent on the pyrolysis conditions such as heating rate due to the complexity of the reaction scheme. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Pyrolysis; Thermal decomposition; Chlorogenic acid; Poly-phenols

* Corresponding author. Tel.: +1-804-2742419; fax: +1-804-2741994.

0165-2370/02/$ - see front matter © 2002 Elsevier Science B.V. All rights reserved.
PII: S0165-2370(01)00126-7

PM3001115342

Source: https://www.industrydocuments.ucsf.edu/docs/ylxk0001